

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA).

By TOM IREDALE and A. F. BASSET HULL.

III.

ISCHNOCHITON DISTIGMATUS.

(Plate xxxv., fig. 2).

Ischnochiton distigmatus Hull. Proc. Roy. Soc. Queensland, xxxvi., 1924, p. 111, Pl. xxi., f. 1. Type in the Queensland Museum.

Shell small, elongate oval, not carinated. Colour purplish-brown when alive, much of the purple disappears when the shell is dry; a dark purple spot on each side of the jugum near the posterior margin of valve iv. The sculpture of the whole shell is finely granulose, graduated in quincunx. The lateral areas of the median valves are raised, but there is no differentiation in the sculpture.

Posterior valve larger than the anterior, with mucro rounded, slightly in front of the middle; posterior slope convex.

Girdle densely packed with small, elongated, lozenge-shaped scales directed backward and outward; not striated; on the underside there are closely packed spicules, radiating outwards from the sutural margins to the outer edge of the girdle.

Interior bluish-white; anterior valve interiorly grooved and with about nine rudimentary slits, median valves 1-1 (in one case there are two obscure slits on one side); posterior valve crenulated but unslit.

Dimensions: 8 x $4\frac{1}{2}$ mm.

Station: On the under side of small stones embedded in the sand between median and low water mark.

Habitat: North Head, Port Denison, Queensland.

Remarks: This shell is easily distinguishable from *Ischnochiton luticolens* Hull, with which it is found associated, by the absence of any marked differentiation in the sculpture on the lateral areas; the uniform colouration, and the shape of the posterior valve, which in *I. luticolens* has the mucro considerably in front of the middle and the posterior slope is concave. It differs from *Subterenochiton gabrieli* Hull in the obscurely slit median valves. It is a degenerate species intermediate between *Ischnochiton* and *Subterenochiton*, the insertion plates and slitting becoming obsolete, and the girdle scales approaching the elongate spiculose character of those of the *Lepidopleuridae*.

Genus SUBTERENOCHITON.

Subterenochiton Iredale and Hull, Aust. Zool., iii., 1924, 227. Type by original designation *Ischnochiton gabrieli* Hull.

Shells of small size for the family, of modest colouration, elongate oval, elevated, sculpture of quincuncially arranged pustules, generally simple. Girdle scales small, smooth, imbricating, irregular. Insertion plates weak, showing slitting in anterior valve only.

The species may be separated by means of elevation and girdle scales.

SUBTERENOCHITON GABRIELI.

(Plate xxxv., fig. 1. Plate xxxvii., figs. 1-6).

Ischnochiton gabrieli Hull, Proc. Roy. Soc. Vic., xxv., 1912, 120, Pl. viii., f. 1 a-f. Type in coll. Gabriel.

Shell small, elongately oval, elevated, subcarinated, side slopes steep and straight. Colour uniformly pallid, of various shades of cream and pink mottled and streaked with yellowish brown.

The whole shell is granosely quineuncially sculptured, but no radiation of grains is at all discernible. Senile shells show concentric growth lines on all valves. The lateral areas of the median valves are well elevated and notably narrowed; and the grains are a little more regular towards the edges.

Posterior valve with mucro slightly post-median.

Girdle fairly wide; scales very small.

Interior white. Slits 10-0-0. Sutural laminae large, broad, distant.

Dimensions: 6 x 4 mm.

Station: Dredged in five to twenty fathoms.

Habitat: Victoria; New South Wales.

Remarks: This species is apparently common in Sydney Harbour, having been dredged in numbers near the Sow and Pigs Reef by Brazier fifty to sixty years ago, and by Hull in 1911. The type was dredged in Western Port, Victoria, by C. J. Gabriel.

SUBTERENOCHITON BEDNALLI.

(Text-fig. a).

Ischnochiton bednalli Torr, Trans. Roy. Soc. S. Aust., xxxvi., 1913, 166, Pl. v., f. 3 a-f. St. Francis I., Nuyts Archipelago, South Australia. Type in coll. Torr.

Shell small, elliptical, valves wide, rounded, slightly carinated, side slopes curved. The posterior margins of the valves project considerably and give a verandah-like appearance. The valves are exceedingly delicate. Colour uniform cream.

Anterior valve having about twenty microscopically pustulose lirae converging towards the apex, with two or three ill-developed growth lines parallel to the girdle.

Median valves: Lateral areas distinctly raised and crossed transversely with four rows of pustulose lirae converging towards the dorsal area; four of these pustules project from the posterior margin; central areas divided into five irregular

diagonal rows of pustules by reticulated sulci, giving the appearance of open network; dorsal area uniform in width, composed of five or six rows of pustules either worn or compressed.

Posterior valve with mucro ante-median, almost covered by the seventh valve; post-mucronal area concave. The mucro is covered with pustules, and the rest of the valve has two or three concentric rings of pustulose lirae parallel to the girdle; the pustules become smaller towards the mucro.

Girdle scales microscopically striated.

Interior pearly-white. Anterior valve with about twenty slits with regularly scalloped pectination between. Median valves showing diminutive slit rays under $\frac{1}{4}$ in. lens. Posterior valve with about twenty-six slit rays. Sutural laminae small and delicate. Sinus very wide.

Dimensions: 6 x 3 mm.

Station: ?

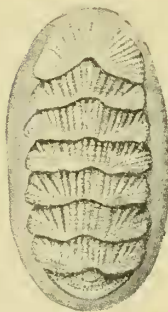


Fig. a.

Habitat: St. Francis Island, Nuyts Archipelago, South Australia.

Remarks: Two examples were taken by the author, who has kindly lent us the type for examination. From its peculiar slitting we have included this species in *Subterenochiton*, owing to the absence of definite slits in the median and posterior valves, though the scales are finely striated.

The above description is that of the author, slightly adapted to the form used in this Monograph, and we have little to add to it, except that the gills are posterior, thus indicating the close relationship of the animal to those of the genera *Terenochiton* and *Parachiton*.

Genus HETEROZONA.

Heterozona Dall, Proc. U.S. Nat. Mus., 1878, 331. Type by monotypy *Heterozona cariosa* Carpenter.

Heterozona Pilsbry, Man. Coneh., xiv., 1892, 65. Type by original designation *Ischnochiton cariosus* Pilsbry.

Shells of large size for the family; colouration of species constant and subdued; sculpture as in *Ischnochiton*, but girdle scaling peculiar: the girdle scales near the valves become larger and even irregularly elongated, while those on the outer half of the girdle remain small and regular; all scales finely striated, the larger ones even deeply grooved; the insertion plates as in *Ischnochiton*.

HETEROZONA FRUTICOSA.

(Plate xxxv., fig. 3).

Chiton fruticosus Gould, Proc. Bost. Soc. Nat. Hist., ii., 1846, 142, New South Wales. U.S. Expl. Exped., 1859, 319, f. 428. Otia, 1862, 4, 242. Type lost, or in Acad. Nat. Sci. Philad.

Chiton divergens Reeve, Coneh. Icon., iv., 1847, Pl. viii., sp. and f. 44. New Holland (Jukes). Type in Mus. Cuming in Brit. Mus.

Chiton (Callistochiton) coppingeri Smith, Zool. Coll. Alert, 1884, 80, Pl. vi. Port Jackson, New South Wales. Type in Brit. Mus.

Ischnochiton fruticosus Pilsbry, Man. Coneh., xiv., 1892, 91, Pl. 23, f. 78-80.

Ischnochiton sowerbyi Pilsbry, loc. cit., 92, ex Carpenter M.S. in synonymy Type in Brit. Mus.

Shell elongately oval, rather depressed, round-backed but semi-carinated; minutely quineuncially punctate throughout. Colour (a) buff or pale brown, greenish or pale blue, with broad light or whitish dorsal stripe; (b) wholly buff, dark brown, or blackish; girdle sometimes barred.

Anterior valve having from 30 to 50 radiating ribs, sometimes splitting towards the margin; apex smooth; posterior edge of valve semi-nodulose.

Median valves: Lateral areas with three or more strong ribs, divaricating towards the margin; posterior edge irregularly obliquely toothed with elongate pustules; central areas with fine zig-zag striations in the jugum, these striations becoming more pronounced laterally, and at the edges of the valves becoming irregular linear ridges, more noticeable in older shells.

Posterior valve with mucro ante-median; post-mucronal area depressed and slightly concave behind; ante-mucronal area as in median central areas; post-mucronal area having long irregular pustules, massing more or less into radiating ribs, but more irregular than on the anterior valve. Some specimens show fairly regular ribs towards the edge only, and below the mucro only quineuncial punctation.

Girdle wide; scales very small near the shell, becoming microscopic at outer edge; striated.

Interior bluish-white, often with brown rayed markings in the centre of the terminal valves. Slits 12-1-12. Sutural laminae broad and distant.

Dimensions: 35 x 28 mm.

Station: Between tide marks, under stones; frequently found in muddy situations.

Habitat: Southern Queensland, New South Wales, Eastern Victoria, South Australia (one example), Tasmania (doubtful record).

Remarks: This is one of the common species found on the eastern coast of Australia; the single example reported from South Australia was collected at Sultana Bay by Mr. E. H. Matthews, and it is a typical shell.

HETEROZONA CARIOSA.

(Plate xxxv., fig. 5).

Heterozona cariosa Dall, Proc. U.S. Nat. Mus., 1878, 331. Description indeterminate.

Ischnochiton cariosus Pilsbry, Man. Conch., xiv., 1892, 65, Pl. xxiv., f. 20-22, ex Carpenter M.S. Australia. Type Acad. Nat. Sci. Philad. May, Illus. Index Tas. Shells, 1923, Pl. xv., f. 5.

Ischnochiton subcariosus Pilsbry, loc. cit. 67, Australia. Type Mus. Cuming in Brit. Mus.

Anisoradsia mawlei subsp. *saundersi* Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 82. Port Lincoln, South Australia. Id. ib., xliii., 1919, 73 (correction). Type in coll. Ashby.

Ischnochiton auratus Ashby, Trans. Roy. Soc. S. Aust., xlv., 1920, 227, Pl. xii., f. 6a and b. Marino, South Australia. Type in coll. Ashby.

Ischnochiton (Heterozona) properensis Ashby, ib., 1920, 278, Pl. xii., f. 7a and b. Proper Bay near Port Lincoln, S.A. Type in coll. Ashby.

Ischnochiton (Heterozona) cariosus var. *occidentalis* Ashby, ib., xlv., 1921, 42. Western Australia. Type in coll. Ashby.

Shell large, depressed, round-backed, elongately elliptical. Colour generally pale yellow to orange, buff, and dark brown; young examples showing a darker streak along the jugum and on the outer margins of the valves.

Anterior valve irregularly rayed, the ribs, about twenty, springing from an almost smooth apex, divaricating by intercalation and increasing to about fifty at the edge, scarcely nodulose; the posterior edges irregularly obliquely dentate; concentric growth lines sometimes strongly represented.

Median valves: Lateral areas irregularly rayed with four to six rays, a few divaricating and becoming nodulose through the breach in continuity caused by the growth lines; others more irregularly nodulose, the posterior edge with large oblique pustules more prominent in younger shells; central areas rather strongly longitudinally ribbed at sides, delicately engraved in zig-zag on the jugum, the sculpture laterally very variable in strength.

Posterior valve with mucro slightly in front of the middle, posterior slope straight; post-mucronal area irregularly rayed with elongate pustules coalescing with age into ribs; ante-mucronal area sculptured as in central areas of median valves.

Girdle broad; scales of two sizes, those nearest the shell larger than the outer series, but in both cases individual scales increase erratically, and near the margin sometimes become tall, semi-curved turrets, notably striate: all scales deeply grooved with eight to twelve grooves; flattened. Some shells show a perfectly normal scale covering until more than half-grown, others show peculiar scale formation at an early age.

Interior white, sometimes shaded with red in centre of posterior valve. Slits 12-1-12.

Dimensions: 52 x 22 (maximum size of a series from Port Fairy, Victoria).

Station: Under stones between tide marks; probably sessile when adult, as old shells are frequently attacked by parasitic growths.

Habitat: Victoria, Northern Tasmania, South Australia, South Western Australia.

Remarks: This is a common and remarkably variable species. We consider that the shells separated by Ashby and included in the above synonymy are merely individual variations and not constant local varieties. The sculpture varies from coarse to fine; the colouration is strongly affected by the nature of the rock, ironstones producing dark red-brown shells and granites producing grey with darker margins; while the girdle scales vary a great deal.

HETEROZONA SUBVIRIDIS.

(Plate xxxv., fig. 4).

Heterozona subviridis Iredale and May, Proc. Mal. Soc., xii., 1916, 105, Pl. iv., f. 2. Port Arthur, Southern Tasmania. Type in Tasmanian Museum.

Ischnochiton subviridis May, Illus. Index Tas. Shells, 1923, Pl. xv., f. 6.

Shell medium to large, rather depressed, scarcely carinated but sometimes a little angulate, side slopes slightly convex. Colour a little variable, generally blue-green, striped along the jugum with white, extremes of colour deepening to blue black or becoming pale cobalt blue; rarely reddish brown.

Anterior valve rayed closely with about 50 flattened fairly regular ribs, intercalating with age; apex smooth; concentric growth lines deeply marked on all adult shells, but rarely forming nodules.

Median valves: Lateral areas having eight or nine close-set rays, sometimes broken into nodules by concentric growth lines, posterior edges feebly denticulate; ventral areas finely wrinkled in zig-zag on jugum, towards the edge the linear wrinkles become wavy.

Posterior valve with mucro ante-median; post-mucronal area rayed as in anterior valve but less regularly and more nodulose; ante-mucronal area as in central areas of median valves.

Girdle wide, scales of two sizes, those near the shell larger than the outer series and tending to mucronate and lengthen. All the scales are very small compared with those of the preceding species, those on the outer edge being microscopic; all scales are striate. (Plate xxxvii., fig. 11).

Interior bluish-green, centre of posterior valve marked with purplish. Slits 11-1-12.

Dimensions: 30 x 16 mm. (Type). 50 x 24. (Maximum of series from Port Arthur, Tasmania).

Station: Under stones between tide marks.

Habitat: Tasmania, Victoria.

Remarks: This shell is very plentiful on King Island, Bass Strait. Iredale and May noted that two variations in shape occurred, one narrow and high, the other broader and lower, and suggested that these varieties might be sexual.

Genus STRIGICHITON.

Strigichiton Hull, Aust. Zool., iii., 1923, 195. Type by original designation *Ischnochiton verconis* Torr.

Shell of large size for the family, of dull colouration; broad rounded oval; sculpture complex and peculiar; girdle scales semi-erect, deeply grooved, of dif-

ferent sizes. Insertion plates strong, teeth sharply defined, not pectinated, but suggestions of denticulation. Slits 12-1-12.

STRIGICHITON VERCONIS.

(Plate xxv., fig. 10. Plate xxxvii., figs. 12, 13).

Ischnochiton verconis Torr, Trans. Roy. Soc. S. Aust., xxxv., 1911, 102, Pl. xxiv., f. 1 a-f. Type in coll. Torr.

Shell large, rounded oval, depressed, semi-carinated, side slopes convex. Colour slaty greyish-green, longitudinally marked with paler.

Anterior valve small, very finely rayed with from eighty to one hundred flattened riblets, growth lines forming semi-nodulose pustules towards the edge.

Median valves: Lateral areas little raised, radially ribbed with fine flattened rays, twenty being counted at edge, and all semi-nodulose through the intersection of growth lines; central areas sculptured rather finely on jugal area with zig-zag ribs which strengthen and extend broadly towards the edges; all ribs flattened.

Posterior valve larger than anterior valve; mucro median, post-mucronal slope a little concave; ante-mucronal area sculptured as in central areas of median valves; post-mucronal area as in anterior valve, about eighty flattened ribs.

Girdle broad; scales large, mucronate, semi-erect, semi-circular in section, deeply grooved with six to ten grooves. (Plate xxxvii., fig. 13).

Interior white, with red-brown rays in anterior and posterior valves. Slits 12-1-12. Sinus between the sutural laminae very broad.

Dimensions: 44 x 28 mm. (Type). 47 x 29 mm. (Hopetoun example).

Station: Under large stones below low water mark.

Habitat: Western Australia (Hopetoun in the Great Australian Bight to Bernier Island on the central western coast).

Remarks: The type of this remarkable species was a unicum taken by Dr. Torr, at Ellenbrook, South-western Australia, in 1910. Hull took two at Hopetoun, about 100 miles east of Esperance Bay, and a single example in the Perth Museum was taken on Bernier Island, Sharks Bay. The range is therefore fairly wide, although the shell is exceedingly rare. It is very active, moving rapidly over the stone when exposed to the light. The girdle scales are the most remarkable feature, the grooving being very deep.

Genus AUTOCHITON.

Autochiton Iredale and Hull, Aust. Zool., iii., 1924, 227. Type by original designation *Ischnochiton torri* Iredale and May.

Shells small to large, of varied colouration; elongate oval; sculpture of *Ischnochiton* generally suppressed or forming elongate pustules through longitudinal concentric growth lines; girdle scales very small, closely imbricating, striated. Insertion plates normal, sutural laminae widely separated, projecting forward.

The three species here associated on account of their weak sculpture, coupled with very small girdle scales, may not be phylogenetically allied. Thus *A. virgatus* develops strong sculpture on the lateral areas in Western Australian examples, and is otherwise aberrant in colouration and size; it may therefore be distinguished by the new subgeneric name *Euporoplax*. The species *A. wilsoni* is as different in its distinctive colour, keeled shape, and smooth glossy surface, and may be differentiated subgenerically by the new name *Euretoplax*.

AUTOCHITON TORRI.

(Plate xxxv., fig. 6).

Ischnochiton torri Iredale and May, Proc. Mal. Soc., xii., 1916, 111, Pl. v., f. 3.

Cape Barren Island. Flinders Group, Bass Strait. Type in Tasmanian Museum. May, Illus. Index Tas. Shells, 1923, Pl. xv., f. 1.

Ischnochiton ustulatus Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 70, footnote, and subsequent writers to 1916.

Shell large, elongate oval, round-backed, side slopes rounded, moderately elevated. Colour cream longitudinally flamed with brown, anterior valve often uniformly red-brown (burnt sienna).

Anterior valve with about fifty rays, sometimes traversed by concentric growth lines.

Median valves: Lateral areas raised, rayed in senile shells, rays strongly concentrically cut, forming elongate pustules; valve vii. always most strongly sculptured; central areas very finely decussate in quincunx, a little coarser and tending to linear arrangement laterally.

Posterior valve with mucro elevated, ante-median; post-mucronal slope a little concave; ante-mucronal area sculptured as in central areas of median valves; post-mucronal area showing faint radials, concentrically pustulose.

Girdle broad, scales very minute elongate ovals, flattened, closely imbricating, striate. (Plate xxxvii., fig. 17).

Interior bluish-white, with centre of end valves and of median valves purplish. Slits 12-1-15.

Dimensions: 42 x 20 mm.

Station: Under stones below low water mark.

Habitat: South Australia, Victoria, Islands of Bass Strait.

Remarks: This is a fairly active species, except in senile examples, which become sessile. The elongate shell, constant notable colouration, and minute girdle scales have suggested that it may be representative of the stock whence *Stenochiton* was derived, the colouration of *S. juloides* being very similar in essence.

AUTOCHITON VIRGATUS.

(a) AUTOCHITON VIRGATUS VIRGATUS.

(Plate xxxv., fig. 7).

Chiton virgatus Reeve. Conch. Icon., iv., 1847, Pl. xxviii., sp. and f. 192. Port

Lincoln, South Australia. Type in Mus. Cuming in Brit. Mus.

Ischnochiton virgatus Pilsbry, Man. Conch., xiv., 1892, 78, Pl. 8, f. 72, 73. May, Illus. Index Tas. Shells, 1923, Pl. xv. f. 2.

Shell small, elongate oval, round backed, not much elevated. Colour olivaceous, varied with yellowish, and spotted with blue-green, a generally well defined colour pattern. The whole shell minutely quincuncially punctate.

Anterior valve faintly striate, rarely concentrically pustulose near the edges.

Median valves: Lateral areas small, smooth, but with elongate pustules concentrically arranged appearing on senile shells.

Posterior valve with mucro ante-median (anterior third); post-mucronal area concave; a few elongate pustules round the edge.

Girdle scales minute, striate.

Interior: Bluish-white. Slits 12-1-12.

Dimensions: 5 x 2 mm. (Type). 11.5 x 4.5 mm.

Station: Under stones between tide marks.

Habitat: South Australia, Victoria, Islands of Bass Strait.

(b) *AUTOCHITON VIRGATUS EXAGGERATUS*, n.subsp.

Shell medium, generally of a dark brown or blackish colour, with faint blue spots; sometimes creamy white. The terminal valves and the lateral areas of the median valves are strongly sculptured with pustules concentrically arranged.

Dimensions: 14 x 6½ mm.

Habitat: South Western Australia (King George Sound).

Remarks: This subspecies differs from the dominant form in its much greater size, darker colouration, and marked sculpture.

AUTOCHITON WILSONI.

(Plate xxxv., fig. 8).

Ischnochiton wilsoni Sykes, Proc. Mal. Soc., ii., 1896, 89, Pl. vi., f. 1, 1a. Port Phillip, Victoria. Type in Nat. Mus. Melb.

Ischnochiton levis Torr, Trans. Roy. Soc. S. Aust., xxxvi., 1913, 168, Pl. vi., f. 6 a-f. Edithburg, South Australia. Type in coll. Torr.

Shell medium, moderately elevated, semi-carinated, oval, glossy, side slopes a little convex. Colour pinkish-white, longitudinally marked with pinkish-brown linear separated markings on the central areas, and similar markings radially arranged on terminal valves and lateral areas of median valves.

Anterior valve very minutely decussate.

Median valves similarly decussate: Lateral areas only indicated by a slight elevation; growth lines indistinct.

Posterior valve with mucro median, elevated; post-mucronal slope concave, having a faint radial ribbing, only seen at the extreme edge.

Girdle broad, colour pale yellowish or flesh, with scattered black spots. Scales very small, imbricating, rounded, each having five deep grooves. (Plate xxxvii., fig. 10).

Interior white with pink tinge. Slits 9-1-10.

Dimensions: 16 x 8. (Type). 26 x 14. (Maximum).

Station: Dredged in shallow water; rarely found under stones below low water mark.

Habitat: Victoria, South Australia.

Remarks: This is a very rare species, notable for its distinctive colouration, lack of sculpture, and minute girdle scales.

Genus *STENOCHITON*.

Stenochiton H. Adams and Angas, Proc. Zool. Soc., 1864, 193. Type by monotypy *Stenochiton juloides* H. Adams and Angas.

Zostericola Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 84, *nom. nud.* Ib. id., xliii., 1919, 66. Type by original designation *Stenochiton pilsbryanus* Ashby.

Shells small to large, but very narrowly elongate owing to their station; brightly coloured with glossy surface; sculpture indefinite; girdle scales small, flat, lozenge-shaped, smooth and highly polished. Insertion plates sharp, not pectinated, numerous in terminal valves, from two to four on each side in median valves; sutural laminae large, separated. The species are all restricted to the Adelaidean region.

STENOCHITON LONGICYMBA.

(a) *STENOCHITON LONGICYMBA LONGICYMBA*.

(Plate xxxvi., fig. 9).

Chiton longicymba Blainville, Dict. Sci. Nat. (Levrault), xxxv., 1825, 542. Ile King, *errore* = Kangaroo Island. Type in Paris Mus.

Stenochiton juloides H. Adams and Angas, P.Z.S., 1864, 193. Holdfast Bay, South Australia.

Schizochiton nympha Rochebrune, Bull. Soc. Philom. Paris, 7th ser. viii., 1884. 36. Ile King (ex Peron and Lesueur) based on Blainville's type of *C. longicymba* (vide supra). Type in Paris Mus.

Ischnochiton (Stenochiton) juloides Pilsbry, Man. Conch., xiv., 1892, 55, Pl. 16, f. 6-8.

Ischnochiton (Stenochiton) nympha Thiele, Rev. Syst. Chitonen, pt. II., 1910, 84, Pl. viii., f. 36-39.

Stenochiton longicymba Iredale and May, Proc. Mal. Soc., xii., 1916, 104.

Stenochiton juloides Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 76, Pl. xiii. and xiv., f. 3, 8, 9, 10 (review).

Shell large, very narrow, elongated, about six times as long as broad, round-backed, elevated, glossy. Colour generally rich purplish-brown flamed with white along the central areas, uniform on anterior valve, lateral areas, and post-mucronal area, girdle banded.

The whole shell is minutely quineuncially reticulate.

Anterior valve smooth, convex.

Median valves: Lengthening from valve ii. to vii., the second valve nearly as long as broad, the sixth and seventh longer than broad: lateral areas large, conspicuously raised, as long as or longer than broad; growth lines pronounced.

Posterior valve with mucro post-median at about posterior third; post-mucronal slope a little concave.

Girdle narrow at sides, wider at ends; scales very small, lozenge-shaped, glossy. (Plate xxxvii., fig. 16).

Interior bluish-white. Slits, anterior valve fifteen to twenty, median valves two to four, posterior valve fifteen to twenty. The normal slitting is probably 15-3-15, many examples showing inter-slitting.

Station: Between the blades or within the root sheaths of sea-grasses (*Zostera*, etc.), occasionally on bottles or other smooth objects, below low water mark.

Habitat: South Australia.

Dimensions: 41 x 6 mm. The smaller shells are broader in proportion to length.

Remarks: Through a misuse of the species name *longicymba* given by Blainville to this species, the type of *Stenochiton* has been long known by the name *juloides* given many years later. Rochebrune found Blainville's type and, as was his wont, redescribed it as a new species, effectually masking its recognition by the selection of an unconformable genus. The correct generic location of Rochebrune's species was shown by Thiele from an examination of Rochebrune's type, and Thiele gave figures substantiating his conclusions. Iredale and May, familiar with Rochebrune's idiosyncrasies, recognised in Thiele's figures the long-lost *longicymba* of Blainville. As Hull and Ashby did not meet with the species on King Island, and Hull found it very common at King George Sound, West Australia, Hull suggested that the latter locality was the source of Peron's specimens. Re-examination of the series collected, however, has shown that the West Australian shell differs very appreciably from that from South Australia, and comparison with Thiele's figures shows that the latter locality is the correct one, and in this State Peron collected at Kangaroo Island, where this species is still procurable.

(b) *STENOCHITON LONGICYMBA* HISTORIA, n. subsp.

(Plate xxxvi., fig. 8).

Shell large, superficially similar to the preceding species, but proportionately broader, less elevated, with valves of different proportions; the median valves

always broader than long, the lateral areas being equilateral triangles. The seventh valve is not disproportionately elongate; and in the posterior valve the ante-mucronal area is not twice as long as the post-mucronal area. Colour is more commonly greenish, splashed throughout with white.

Dimensions: 45 x 9 mm.

Habitat: South Western Australia.

STENOCHITON PILSBRYANUS.

(a) STENOCHITON PILSBRYANUS PILSBRYANUS.

(Plate xxxvi., fig. 10).

Ischnochiton (*Stenochiton*) *pilsbryanus* Bednall, Proc. Mal. Soc., ii., 1897, 142, text-fig. Trounbridge Shoal, Gulf St. Vincent, South Australia. Co-types in Acad. Nat. Sci. Philad. and coll. E. H. Matthews.

Stenochiton posidonialis Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 72, Pl. xiii. and xiv., f. 2, 6, 13, a, b, c, d. Eastern side of Gulf St. Vincent. Type in coll. Ashby.

? *Zostericola pilsbryanus* Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 66. (Re-description of a minute shell in the collection of Dr. Torr, which may be a juvenile example of *S. pallens*).

Shell medium, narrow elongate oval, glossy, round-backed, about three times as long as broad. Colour (a) pale yellowish-green, flamed with white. (b) dull brown and cream, some valves being wholly brown, others grey with a brown patch on the jugum.

The whole shell is minutely quincuncially decussate, but the decussation is more striking and a little coarser than in the preceding species.

Anterior valve broader than long, concave, but the concavity is not so noticeable in juvenile shells.

Median valves broader than long; lateral areas showing no diagonal elevation, little raised; second valve more elevated than apex of the anterior valve; valves iii. to vii. decreasing in elevation.

Posterior valve long, but not abnormally so; mucro median; post-mucronal slope a little concave.

Girdle narrow, sometimes banded; scales minute, but larger than those of *S. longicymba*, and more elongate ovals in shape.

Interior white or pale olive green. Slits 18-2 to 3-19.

Dimensions: 15 x 5 mm. (Type), 20 x 5. (Maximum of examples examined). 9.5 x 3.5. (Type of *S. posidonialis*).

Station: On the leaves of sea-grass. (*Zostera*, *Posidonia* sp.).

Habitat: Victoria, South Australia.

Remarks: This shell was described by Bednall, and the next figures were prepared by Pilsbry from a juvenile specimen which (although the description is not exact) with our further knowledge we consider to be this species. Ashby (*loc. cit.*) has expressed the opinion that Bednall's figure and description of *S. pilsbryanus* were made from more than one specimen covering more than one species. In the first paper cited he rejected Bednall's name and re-described a shell under the new name of *S. posidonialis*. In the second paper he quotes Iredale (in correspondence) as agreeing with his action in renaming *S. pilsbryanus*, "as it did not agree with Bednall's figures at all." We have since had the advantage of examining a large series of shells from both South and Western Australia, as well as a personal discussion of the subject with Professor Pilsbry, and we have before us the original drawings and the co-types from Bednall's collection, lent us by Mr. E. H. Matthews. Professor Pilsbry informs us that the specimen from which he made the drawing is now in the Academy of Natural

Sciences, Philadelphia, having been segregated by him: there are also a number of more or less fragmentary specimens which he had shown to Mr. Ashby, who considered they comprised two species. Allowing for the fact that the original drawing was in outline only, and in view of the further fact that the concavity of the anterior valve is less perceptible in juvenile shells (the figured specimen was not full grown) we see no reason why the shell so long recognised and distributed by South Australian collectors as *S. pilsbryanus* should be renamed.

(b) *STENOCHITON PILSBRYANUS DILATUS*, n. subsp.

(Plate xxxvi., fig. 11).

This shell differs from the South Australian species in that it is flatter, the elevation being more uniform; in the different proportions of the valves which are broader in proportion to length; and in the rather less raised diagonal of the lateral areas. Both colour patterns, as described above, are found in Western Australia, and these two patterns are indicated in the respective figures on Plate xxxvi.

Station: On the blades of the sea grasses, rarely found in the root sheaths.

Habitat: Western Australia, from Lucky Bay, 25 miles east of Esperance, to Fremantle.

STENOCHITON CYMODOCEALIS.

(Plate xxxvi., fig. 12).

Stenochiton cymodocealis Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 70, Pl. xii. and xiv., f. 1. 4. 5, 11. 12 (a, b, c, d, e). Marino, South Australia.

Type in coll. Ashby.

Shell small, narrowly elongate, round-backed, elevated, glossy. Colour brown or green, longitudinally streaked with white.

The whole shell is quincuncially decussate, the decussation being as fine as in *S. longicymba*.

Anterior valve shorter than broad; convex.

Median valves a little elongate, broader than long; lateral areas little elevated, normal in shape, being much longer than broad.

Posterior valve elongate; mucro ante-median, planate; post-mucronal slope straight and long.

Girdle narrow, in life clasping round the stalk of its host *Cymodocea*; scales minute, lozenge-shaped.

Interior greenish white. Slits 12. 13-1-13. 15.

Dimensions: 10 x 2.5 mm.

Station: On stalks of the sea grass *Cymodocea*.

Habitat: Victoria, South and Western Australia.

STENOCHITON PALLENS.

(Plate xxxvii., fig. 8).

Ischnochiton (Stenochiton) pallens Ashby, Trans. Roy. Soc. S. Aust., xxiv., 1900, 86, Pl. 1, f. 1 a-g. Gulf St. Vincent, South Australia. Type in coll. Ashby.

Stenochiton pallens Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 75, Pl. xiv., f. 14a, b. (Review).

Shell medium, elongate, three times as long as broad, round-backed, glossy. Colour olive-green, longitudinally streaked with pale brown.

Anterior valve twice as broad as long; smooth, glossy, showing faint concentric growth lines.

Median valves normal; lateral areas raised but scarcely differentiated.

Posterior valve elongate, as long as broad; mneron at the posterior third, nearly planate; post-mneronal slope straight; ante-mneronal area an equilateral triangle.

Girdle narrow; scales small, irregular, imbricating, finely striated.

Interior white. Slits 13-1 or 2-6 (? 16).

Dimensions: 26 x 7 mm.

Station: Dredged.

Habitat: South Australia, Victoria.

Remarks: The examination of a eo-type of this distinct species lent us by Mr. Ashby suggests that it is closely related to *Autochiton wilsoni*, and that the *Stenochitons* may have arisen from two or three species of the same genus through adaptation to their new station.

Genus ANISORADSIA.

Anisoradsia Iredale and May, Proc. Mal. Soc., xii., 1916, 104 and 108. Type by monotypy *Ischnochiton (Anisoradsia) mawlei* Iredale and May.

Shell large, elongate, elliptical, round-backed, moderately elevated; colon-ration constant. Sculpture of *Ischnochitonoid* appearance, but complexly exaggerated in detail. Scales small, regular, imbricating ovals, closely deeply striate. Interior with the sinus broad, two to four slits in median valves, multislit in terminal valves, eighteen to twenty-five.

ANISORADSIA MAWLEI.

(Plate xxxv., fig. 9. Plate xxxvii., fig. 14).

Ischnochiton (Anisoradsia) mawlei Iredale and May, Proc. Mal. Soc., xii., 1916, 108, Pl. iv., f. 4. Port Arthur, S. Tasmania. Type in Tasmanian Musnm. May, Illnstr. Index Tas. Shells, 1923, Pl. xv., f. 4.

Shell large, elongate, elliptical, not much elevated, round-backed, side slopes rounded. Colour orange to pale yellow.

Anterior valve rayed with about fifty wavy ribs, divaricating towards the margin, apical portion devoid of ribbing; posterior edges erennately irregular.

Median valves: Lateral areas with eight ribs divaricating into sixteen, all irregular and wavy; central areas finely wavy in zig-zag on jugal area, lines strengthening and becoming less wavy, but still never straight, towards the edge.

Posterior valve with mneron ante-median; post-mucronal area irregularly pustulose, forming ribs tending to become wavy towards the edge.

Girdle broad; scales small, striated (10-12 grooves) fairly nniform in size throughout, but slightly larger and suberect near the shell.

Interior white. Slits 20 to 25-2 to 4-18; teeth very short.

Dimensions: 34 x 18 mm. (Type). 51 x 24 mm.

Station: Under stones below low water mark. Animal fairly active, but apparently becoming sessile with age, as very old examples show parasitic growths on the posterior valves.

Habitat: South-western Tasmania.

Genus ISCHNORADSIA.

Ischnoradsia Shuttleworth, Mittheil. Naturf. Gesell. Berne, 1853, 65. Type by monotypy *Chiton australis* Sowerby.

Lepidoradsia Dall, Proc. U.S. Nat. Mns., 1878, 331. Ex Carpenter M.S. Type by original designation *Chiton australis* Sowerby.

Shells of very large size; constant dark colouration; elongate ovals; sculp-

ture in quincunx on central areas sometimes forming into linear aggregations; on end valves and lateral areas into ridges, few in some cases, many in others. Girdle scales large, rounded, uniform in shape, with peaked edge, faintly horizontally striate. Insertion plates strong, multislit in end valves, more than one (two to four) in median valves.

ISCHNORADSLA AUSTRALIS.

(a) ISCHNORADSLA AUSTRALIS AUSTRALIS.

(Plate xxxvii., fig. 9, scales only).

Chiton australis Sowerby, Mag. Nat. Hist. (Charlesworth), iv., 1840, 290. Australia. Conch. Illus. (Chiton), 1840, f. 46. Type lost.

Chiton metallicus Reeve, Conch. Icon., iv., 1847, Pl. xvii. sp. and f. 104. Australia. Type Mus. Cuning in Brit. Mus.

Chiton (*Lophyrus*) *lugubris* Gould, Proc. Bost. Soc. Nat. Hist., vii., 1859, 163. Otia, 1862, p. 116. Type lost (?).

Ischnochiton australis Pilsbry, Man. Conch., xiv., 1893, 144, Pl. 18, f. 57-59. Port Jackson, Australia.

Ischnochiton lugubris Pilsbry, Man. Conch., xiv., 1893, 146.

Ischnoradsia australis Ashby, Trans. Roy. Soc. S. Aust., xlii., 1918, 62, 64 (review).

Shell large, depressed, broad elongate oval, subearinated. Colour uniform dark slaty-green, rarely brown or blue.

Anterior valve rayed with twenty to thirty irregular ribs, divaricating towards the edge.

Median valves: Lateral areas with four to six branching or divaricating ribs, irregular, wavy; central areas longitudinally ribbed throughout, ribs fine and closer together on the jugum, stronger and more distant towards the edge.

Posterior valve with muero ante-median; post-mueroal slope concave; ante-mueroal area sculptured as on central areas; post-mueroal area sculptured as on anterior valve, but ribs still more irregular and tending to become nodulose through cutting by concentric growth lines.

Girdle moderately broad; scales as above (generic). (Plate xxxvii., fig. 9).

Interior blue, with reddish-purple centre to median valves, margined posteriorly with dark brown, purplish line along slit grooves; end valves with brown centre. Slits, anterior valve 19, median valves 2 to 4, posterior valve 16, teeth blunt, grooved interiorly.

Dimensions: 76 x 40 mm.

Station: Under stones below median tide mark.

Habitat: New South Wales, Eastern Victoria.

(b) ISCHNORADSLA AUSTRALIS DIVARICATA.

(Plate xxxv., fig. 11).

Ischnoradsia australis divaricata Hull, Aust. Zool., iii., 1923, 196, Pl. xxvii, f. 1a, b, c, d. Caloundra and Point Cartwright, South Queensland. Type in Queensland Museum.

Shell large. Colour uniform dark slaty-green.

Differs from *I. australis* in the following particulars:—The central areas are strongly sculptured with two or three rows of straight vertical lines, separated by fine horizontal lines after the pattern of a picket fence. The sculpture of the lateral areas is much more branching and composed of fewer riblets than in the dominant species.

Habitat: Southern Queensland.

Remarks: This and the preceding subspecies are amongst the commonest

Loricates, being found, especially in New South Wales, in vast profusion in the shallow pools of the sandstone region. Examination of a series of juvenile specimens shows that the sculpture of the lateral areas commences in the form of three small rounded tubercles near the exterior margin. These tubercles are increased by one or more behind the first, which show a tendency to become elongated. The exterior margin then shows three tubercles, with a succession of three or more rows behind them; the tubercles are then rapidly elongated with the growth of the shell, gradually extending to and partially fusing with each other, thus forming the widely branching sculpture of the adult shell.

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ISCHNORADSIA EVANIDA.

(a) ISCHNORADSIA EVANIDA EVANIDA.

(Plate xxxv., fig. 12).

Chiton evanidus Sowerby, Mag. Nat. Hist. (Charlesworth), iv., 1840, 291. New Holland. Type lost. Conch. Illus. (Chiton), 1840, f. 139.

Ischnoradsia evanida Iredale and May, Proc. Mal. Soc., xii., 1916, 111.

Ischnochiton evanida May, Illus. Index Tas. Shells, 1923, Pl. xv., f. 3.

Shell very large, elongate oval, elevated, semi-carinated, side slopes nearly straight. Colour uniform dark slaty-green.

Anterior valve with about forty ribs, more or less irregularly broken, doubled, and sometimes divaricating; apex smooth.

Median valves: Lateral areas with seven to eight ribs, divaricating towards the edge; central areas very minutely reticulate, fine slanting striae developing towards the edge with age, entirely absent until the shell is about half-grown.

Posterior valve with mucro ante-median; post-mucronal slope concave.

Shell otherwise similar to *I. australis australis*, but reaching much greater dimensions.

Habitat: Tasmania, East and South.

(b) ISCHNORADSIA EVANIDA NOVAE-HOLLANDIAE.

Chiton novaehollandiae Reeve, Conch. Icon., iv., 1847, Pl. xxi., sp. and f. 142.

Ex Grey M.S. New Holland. Type in Brit. Mus.

Ischnochiton novaehollandiae Pilsbry, Man. Conch., xiv., 1893, 145, Pl. 19, f. 67-69. Adelaide, South Australia.

Shell similar to the preceding subspecies, but the central areas are generally smooth, rarely showing any sculpture at all.

Habitat: South Australia, Western Victoria, Northern Tasmania.

Remarks: This and the preceding subspecies differ from *I. australis* in the weaker sculpture throughout, the median valves never show distinct ribs in the central areas, and the lateral areas are more closely and regularly ribbed. The young shells of both species show no striations on the central areas, and few ribs on the lateral areas; while the sculpture develops earlier on the northern species and becomes very strong in the adult, the southern species never at any time show a very strong sculpture. The girdle scales of the young of all the preceding forms begin as normal ovals, developing the characteristic rounded form with age.

Genus HAPLOPLAX.

Haploplax Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 71. Type by original designation, *Lophyrus smaragdinus* Angas.

Shells of medium size for the family, of striking colouration, and generally shining surface; elliptical or rounded oval in form; sculpture weak, sometimes

negligent; girdle scales rounded, highly polished, smooth or faintly striate; insertion plates, slitting, and sutural laminae normal.

In this group the species are best separated by means of colour and form; while the girdle scales provide a useful character for the purposes of the following key:—

- Girdle scales large, smooth:
 - Sculpture: radials absent, except in senile shells:
 - Colouration variable *smaragdina*.
 - Colouration distinctive *resplendens*.
 - Colouration: blue spots always present:
 - Form broadly ovate *lentiginosa*.
 - Sculpture: radials present:
 - Girdle scales small, smooth:
 - Colouration consistent:
 - Form elliptical *thomasi*.
 - Colouration absent:
 - Form narrowly ovate *pura*.
 - Girdle scales faintly striate:
 - Sculpture: strong radials present *arbutum*.

HAPLOPLAX SMARAGDINA.

(Plate xxxvi., fig. 1).

Lophyrus smaragdinus Angas, P.Z.S., 1867, 115, Pl. xiii., f. 28. Port Jackson. New South Wales. Type in Brit. Mus.

Ischnochiton smaragdinus Pilsbry, Man. Conch., xiv., 1893, 137, Pl. 60, f. 20. Port Jackson, N.S.W., May, Illus. Index Tas. Shells, 1923, Pl. xiv., f. 15.

Ischnochiton smaragdinus picturatus Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 72. Port Jackson, N.S.W. Type in coll. Acad. Nat. Sci. Philad.

Ischnochiton (Haploplax) smaragdinus Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 224.

Shell medium, broadly elongate oval; elevated; carinated. Colour extremely variable:—(a) Green, ocellate (typical), brown, slate, or dull purple, with or without ocellate markings. (b) White, yellow, slate with terminal valves black or other contrasting colour. (c) Wholly black with white or yellow girdle. (d) Having a broad dorsal stripe in purple, blue, or brown, unevenly margined with darker colour which extends to the girdle on valves ii. and vi., the remainder of shell variously coloured in contrast (typical *picturatus*). (e) Colours disposed somewhat like in variety d, but without distinctive dorsal stripe.

The whole shell is covered with a minute reticulate pattern, produced by the body colouration being broken by the finely punctate surface.

Anterior valve smooth, with fine concentric growth lines towards the margin.

Median valves having lateral areas indicated by elevated ridge; radial sculpture present in senile shells only; central areas having latitudinal lines resembling growth lines, faint but always visible, curving towards and sometimes crossing the diagonal.

Posterior valve with mucro ante-median, prominent; post-mucronal area showing indications of wavy radials near the margin, stronger in senile shells.

Girdle scales large, smooth, highly polished, largest in the middle of the girdle, diminishing as they approach the shell and the margin. (Plate xxxvii., fig. 7).

Interior white, green or pink, largely affected by the surface colour. Slits 10, 11-1-12.

Dimensions: 28 x 16½ mm. (Southern Tasmania).

Station: Under stones between median and lowest spring tide marks; occasionally found on roots of *Zostera*.

Habitat: Southern Queensland, New South Wales, Eastern Victoria, Tasmania.

Remarks: The animal is very active and evidently moves about considerably within its zone. It prefers clean waters, and is rarely attacked by parasitic growths. Its colours are brightest and most varied when found on the sandstones of Southern Queensland and New South Wales. The radial sculpture on the lateral areas is more marked, and appears in younger shells from Queensland. We have seen brilliant examples mounted in the form of sleeve-links, scarf-pins, etc.

HAPLOPLAX RESPLENDENS.

(Plate xxxvi., fig. 2).

Ischnochiton resplendens Bednall and Matthews, Proc. Mal. Soc., vii., 1906, 91, Pl. ix., f. 4. Gulf St. Vincent and Spencer's Gulf, South Australia. Type in coll. Matthews.

Ischnochiton (Haploplax) smaragdinus subsp. *resplendens*, var. *westernensis* Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 226. Yallingup, Western Australia. Type in coll. Ashby.

Shell medium, moderately elevated, semi-carinated, side slopes nearly straight: form elliptical. Colour bluish-green, dark blue or grey, with whitish rays and darker or brown band along the jugum ornamented with blue splashes; girdle generally banded.

The whole shell is covered with a coarse reticulation (as compared with the preceding species) the reticulation falling into wavy lines.

Anterior valve with very faint radial ribbing, only seen under a lens, superficially smooth.

Median valves: Lateral areas well raised, having faint radials discernible only under a lens.

Posterior valve with mucro raised, ante-median; post-mucronal area with faint radial ribbing as on anterior valve; posterior slope nearly straight.

Girdle scales large, round, polished, not striate.

Interior white or bluish, darker under the jugum. Slits 9-1-11.

Dimensions: 22 x 12½ mm. (Type). 29 x 17 mm. (Yallingup, Ashby).

Station: Under stones between median and low tide marks.

Habitat: Victoria, west of Wilson's Promontory, South Australia, South Western Australia.

Remarks: This species is easily separated from *H. smaragdina* by the colour pattern and the wavy lines of the reticulation. Further, the shell is not glossy, but of a soft texture that may be termed matt. The Western Australian shell attains large proportions, and is darker in colour than those from east of the Leeuwin. The nomination of this variety may be shortened to *Haploplax resplendens westernensis*, but the peculiar usage of *westernensis* for *occidentalis* calls for some comment. Quoy and Gaimard proposed *westernensis* for a bird from "Western Port," Victoria, and it has been erroneously adopted by other authors to express an occidental or Western Australian origin.

HAPLOPLAX LENTIGINOSA.

(Plate xxxvi., fig. 5).

Chiton lentiginosus Sowerby, Mag. Nat. Hist. (Charlesworth), iv., 1840, 293.

Australia (? Newcastle). Conch. Illus., f. 120. Type lost.

Ischnochiton (Haploplax) lentiginosus Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 73. Port Hacking, N.S.W.

Shell medium, broadly ovate, little elevated, semi-carinated, side slopes a little rounded. Colour: On a ground colour of brown, yellow, or blackish, sometimes relieved by white bars or sections, numerous bright blue spots are distributed over the whole shell. These blue spots are generally square or oblong in shape, and sometimes fall into regular series raying out from the jugum; in other cases the spots are large, irregular, and show a tendency to become confluent. Where the ground colour is broken by pure white patches the spots are absent therefrom. We have seen a wholly white shell without any trace of the blue spots. The colour of the girdle is generally similar to the ground colour of the shell, but may sometimes be found in alternate bars of light and dark.

The sculpture of the whole shell consists of fine granules arranged in quin-cunx.

Anterior valve: Fine concentric lines, traversed in senile shells by faint radial ribbing.

Median valves: Lateral areas slightly raised and separated from the central areas by a broad low rib, increasing in width towards the margin. The central areas are latitudinally marked by growth lines which curve on reaching the diagonal and cross the lateral areas longitudinally.

Posterior valve with mucro, ante-median, a little depressed; post-mucronal slope slightly concave, subobsoletely rayed, more prominently towards the edge.

Girdle scales large, rounded, highly polished, not striate.

Interior: variable according to surface colouring, the brown shells being bluish, centre pink, with dark brown on posterior margin of valves; the yellow shells are greenish with dark green centre. Slits 11-1-13.

Dimensions: 27 x 18 mm.

Station: Under or at the edge of insertion of stones embedded in sand between high and median tide marks, rarely found lower.

Habitat: New South Wales, Eastern Victoria (Mallacoota and Lakes Entrance), South Australia (Gulf St. Vincent, E. H. Matthews).

Remarks: This species is mostly remarkable for its blue freckled colour, which is so constant as to come within the category of specific colouration. The granulose surface is much coarser than that of *H. smaragdina*, and differs from that of *H. resplendens* in the regular arrangement of the granules. Its station—the highest littoral zone—is also remarkable, as the only other Loricates inhabiting this zone are the large shells of the genera *Poneroplax*, *Sypharochiton*, *Liolophura*, and their allies, the other members of the genus *Haploplax* being found below median tide mark.

The ground colour of the shell is greatly influenced by the nature of the littoral rock, sandstones producing pale yellow and orange shells, while ironstones and shales produce dark brown to black shells, with occasional white patches.

HAPLOPLAX ADELAIDENSIS.

(Plate xxxvi., fig. 6).

Chiton adalaidensis Reeve, Conch. Icon., iv., 1847, Pl. xix., f. 123. Port Adelaide, New Holland (Harvey). Type Mus. Cuming in Brit. Mus.

Chiton (Ischnochiton) adalaidensis Smith, Zool. Coll. Alert, 1884, 79. Port Molle, Queensland.

Ischnochiton adalaidensis Pilsbry, Man. Conch., xiv., 1893, 136, Pl. 24, f. 7, 8.

Ischnochiton (Haploplax) misimaensis Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 228, Pl. xvi., f. 6. Misima, Papua. Type in coll. Ashby.

Shell medium, elliptical, moderately elevated, semi-carinated, side slopes rounded. Colour pale olive-green, streaked with dull red chiefly on the jugum and on the outer edges of the valves.

The sculpture of the whole shell consists of a minute granulose reticulation.

Anterior valve having about fifty radials, rather weak and becoming obsolete towards the apex; in senile shells the concentric growth lines break the continuity of the radials.

Median valves: Lateral areas raised, sculptured with five to seven radials, stronger than those of the anterior valve, and divaricating outwardly; central areas smooth, except for the reticulation and some fine growth lines.

Posterior valve with mucro ante-median, prominent; post-mucronal area concave, having about forty radials similar to those of the anterior valve.

Girdle scales large, rounded, highly polished, largest in the centre and diminishing towards the shell and the margin; each scale more or less blackish or dark green distally, the regular arrangement of the particoloured scales imparting a barred appearance to the girdle.

Interior greenish; slits 13-1-15, adult shell. (16-1-19 juv.).

Dimensions: 22 x 13½ mm.

Station: Under stones between median and low tide marks.

Habitat: North Queensland, Whitsunday Group (Coppinger), and Cooktown (Hull), Papua (Ashby).

Remarks: Reeve's locality, "Port Adelaide, New Holland," has been questioned by Bednall (Proc. Mal. Soc., ii., 1897. 157) and by most of the South Australian collectors with whom we have been in correspondence, and whose exhaustive search has failed to discover the species in South Australia. Bednall erroneously identifies Reeve's "Harvey" (the collector) with W. H. Harvey who collected in South Australia, 1854-6. As Reeve described the type in 1847, the reference was undoubtedly to Dr. J. B. Harvey, whose address in 1839 was Kingscote, Kangaroo Island, while he was at Port Lincoln (S.A.) in 1842 (Thomas, Ann. and Mag. Nat. Hist., 1921). E. A. Smith redescribed this species from several examples taken by Dr. Coppinger of H.M.S. *Alert* at Port Molle (Whitsunday Passage, North Queensland). As he had Reeve's type for comparison Smith's redescription is to be regarded as a valuable amplification of a previously incomplete diagnosis. Ashby, in describing his *H. misimaensis* from Papua, concludes that the Coppinger specimens from Port Molle are really conspecific with his shell. He also admits the possibility that Reeve's shell may have come from one of these northern localities, "and, after all, not conspecific with *H. lentiginosus*, to which species Mr. Iredale and the writer referred it in their examination of the type in the British Museum, with aid of pocket lens only." Iredale takes this opportunity of correcting a misapprehension. The reference of Reeve's type to Sowerby's *H. lentiginosa* was Ashby's, and was never acquiesced in by Iredale. In May, 1924, Hull, collecting on Grassy Island, one of the Whitsunday Group and a few miles only from Port Molle, Queensland, took several examples of a shell so absolutely in agreement with Smith's meticulous description of the Coppinger shell that he had no hesitation in identifying it as such. Later, in company with E. H. Matthews, the veteran South Australian collector, Hull took another example of the species at Cooktown, about 400 miles north of Port Molle, and Matthews at once acclaimed it the "long lost *H. adalaidensis*." The species may safely be omitted from the Adelaidean fauna. Possibly Reeve's type was collected by Jukes of H.M.S., *Fly*, in Queensland waters and wrongly attributed to Harvey by the author. The animal is extremely active, moving more rapidly than any other species known to the authors. It is very uniform in colour, and unaffected by parasitic growths.

HAPLOPLAX THOMASI.

(Plate xxxvi., fig. 3).

Ischnochiton thomasi Bednall, Proc. Mal. Soc., ii., 1897. 149, text fig. and Pl.

xii., f. 4, 5. Marino, Gulf St. Vincent, South Australia. Type in coll. Matthews.

Ischnochiton cuneatus Matthews M.S., Journ. Conch. (Leeds), viii., 1897, 378. based on *I. thomasi* var. Bednall, *loc. cit.*, f. 4.

Shell medium, elongate oval, rather elevated, semi-carinated; smooth, glossy. Colour pale green, blotched with small white markings, sometimes wedge-shaped.

The shell is microscopically quineuncially punctate throughout.

Anterior valve having no radial sculpture.

Median valves: Lateral areas little raised, no distinct diagonal rib.

Posterior valve with mucro ante-median, elevated; post-mucronal area concave.

Girdle scales small, glossy, not so round as in other species of the genus. (Plate xxxvii., fig. 15).

Interior white with a bluish tinge. Slits 10-1-9.

Dimensions: $21\frac{1}{2} \times 12$ mm.

Station: Under stones in pools between tide marks.

Habitat: Marino, Gulf St. Vincent, South Australia.

Remarks: The colour pattern and girdle scales of this species are so distinct that there is no difficulty in separating it from the other members of the genus. Bednall figured and described a variety, which Matthews in MSS named *cuneatus*. This name was published as a *nomen nudum* at the place cited. Although Matthews still contends that it is a distinct species and has sent us many specimens, we cannot at present recognise a specific difference. The colour pattern of *H. thomasi* may be found in some New South Wales examples of *H. smaragdina*, which suggests relationship.

HAPLOPLAX PURA.

(Plate xxxvi., fig. 4).

Ischnochiton (Haploplax) pura Sykes, Proc. Mal. Soc., ii., 1896, 88, Pl. vi., f. 3, 3a. Port Phillip, Victoria. Type in Melbourne Museum.

Shell small, elongate oval, moderately elevated, semi-carinated; posterior valve large. Colour pure white, glossy.

All valves without radials, but with concentric growth lines; minutely quineuncially decussate throughout.

Median valves: Lateral areas scarcely elevated.

Posterior valve large, mucro central, post-mucronal area concave.

Girdle wide, scales small, elongate, smooth, flattened, closely imbricating.

Interior white. Slits 10-1-11.

Dimensions: 11×6 mm.

Station: Dredged in 10-20 fathoms.

Habitat: Southern New South Wales, Victoria.

Remarks: For this species, assigned by Sykes to *Haploplax*, and by other writers allowed to remain there on account of its smooth shell and extreme rarity, we propose a new subgenus *Chartoplax*, as the smooth scales are in form quite unlike those of any other member of the genus.

HAPLOPLAX ARBUTUM.

(Plate xxxvi., fig. 7).

Chiton arbutum Reeve, Conch. Icon., iv., 1847, Pl. xxiv., sp. and f. 162. Loc.

? = Port Essington, N.W. Australia, on *Pinna*. Type in Brit. Mus.

Ischnochiton arbutum Pilsbry, Man. Conch., xiv., 1893, 139, Pl. 24, f. 16, 17.

Ischnochiton arbutum Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 112.

Shell small, rounded oval, moderately elevated, semi-carinated, side slopes rounded. Colour rather variable, generally dull sage-green with a lighter jugal stripe irregularly projecting on valves iii. and vii.; rarely dull red or spotted with red (type colour of Reeve's "Strawberry" Chiton); pale yellow, or black.

The whole shell is coarsely quincuncially granulose.

Anterior valve closely radially ribbed, ribs a little flattened and semi-granose, as if merely elevated rays of the quincuncial sculpture.

Median valves: Lateral areas strongly raised, radially ribbed as in the anterior valve, the ribs generally six, splitting towards the margin.

Posterior valve with mucro at about the anterior third; post-mucronal area slightly concave, ribbed as in the anterior valve.

Girdle scales large, rounded, glossy, weakly striate.

Interior white or greenish. Slits 11 to 13-1-15 to 16.

Dimensions: 14 x 9 mm.

Station: Under stones embedded in sand or mud, or on *Pinna*, between median and low tide marks.

Habitat: Queensland from Port Curtis to Cape York; Northern Territory.

Remarks: Although Reeve assigned no locality in his original description of this species, the type tablet in the British Museum has the original label attached to the back. This label bears, in J. Macgillivray's handwriting, "on *Pinna*; Pt. Essington, Oct., 1844, 1090." (The last number is Macgillivray's collection number). When collecting on the coast of North Queensland, 1921-4, Hull found this the common littoral shell, inhabiting muddy situations, and frequently in the Mangrove association.

There is a shell in the British Museum, labelled "*Lepidopleurus cygneus*, Carpenter, Swan River," which comes close to *H. arbutum*, but it has finer sculpture on the anterior, posterior, and central areas of the median valves; while the lateral areas are more distinctly ridged. This form probably came from North-western Australia, for it must be remembered that "Swan River" was the original name of the present State of Western Australia, and the species does not live in South-western Australia. We anticipate that it will be rediscovered shortly north of Carnarvon.

EXPLANATION OF PLATES.

Plate xxxv.

- Fig. 1. *Subterenoichiton gabrieli* Hull.
 2. *Ischnochiton distigmatus* Hull.
 3. *Heterozona fruticosa* Gould.
 4. *Heterozona subviridis* Iredale and May.
 5. *Heterozona cariosa* Dall.
 6. *Autochiton torri* Iredale and May.
 7. *Autochiton virgatus* Reeve.
 8. *Autochiton wilsoni* Sykes.
 9. *Anisoradsia mawlei* Iredale and May.
 10. *Strigichiton verconis* Torr.
 11. *Ischnoradsia australis divaricata* Hull.
 12. *Ischnoradsia evanida evanida* Sowerby.

Plate xxxvi.

- Fig. 1. *Haploplax smaragdina* Angas.
 2. *Haploplax resplendens* Bednall and Matthews.
 3. *Haploplax thomasi* Bednall.
 4. *Haploplax pura* Sykes.
 5. *Haploplax lentiginosa* Sowerby.
 6. *Haploplax adclaidensis* Reeve.
 7. *Haploplax arbutum* Reeve.
 8. *Stenochiton longicymba historia* Iredale and Hull.
 9. *Stenochiton longicymba longicymba* Blainville.
 10. *Stenochiton pilsbryanus pilsbryanus* Bednall.
 11. *Stenochiton pilsbryanus dilatus* Iredale and Hull.
 12. *Stenochiton cymodoccalis* Ashby.

Plate xxxvii.

- Fig. 1. *Subterenoichiton gabrieli* Hull. Anterior valve, exterior.
 2. *Subterenoichiton gabrieli* Hull. Anterior valve, interior.
 3. *Subterenoichiton gabrieli* Hull. Half of a median valve.
 4. *Subterenoichiton gabrieli* Hull. Posterior valve, exterior.
 5. *Subterenoichiton gabrieli* Hull. Posterior valve, interior.
 6. *Subterenoichiton gabrieli* Hull. Girdle scales.
 7. *Haploplax smaragdina* Angas. Girdle scales.
 8. *Stenochiton pallens* Ashby.
 9. *Ischnoradsia*. Girdle scales (generic).
 10. *Autochiton wilsoni* Sykes. Girdle scales.
 11. *Heterozona subviridis* Iredale and May. Girdle scales.
 12. *Strigichiton verconis* Torr. Median valve, interior.
 13. *Strigichiton verconis* Torr. Girdle scales.
 14. *Anisoradsia mawlei* Iredale and May. Median valve, interior.
 15. *Haploplax thomasi* Bednall. Girdle scales.
 16. *Stenochiton longicymba longicymba* Blainville. Girdle scales.
 17. *Autochiton torri* Iredale and May. Girdle scales.